CITY PLANNING IN RELATION TO GEOGRAPHICAL FACTORS, ESPECIALLY CLIMATIC

BY

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THESIS

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URBANA, ILLINOIS

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Introduction

"It is with cities as with humans, some are born great, some achieve greatness, and some have greatness thrust upon them."--J. P. Goode. American cities unlike European cities do not have a historical past but they have grown up on response to two factors (1) industrial and (2) commercial. European cities are centuries old and have been influenced by historical and political happenings. Some of them have continued to grow throughout the many years of history, others have remained stationary at times and at other times have had boom years, and still others have degenerated and have been forced into oblivion due to changing conditions such as the establishment of new trade routes or the development of new types of transportation. It might be said, to some extent at least, the experience of people in European lands fave them a background and a desire to settle in certain definite types of areas when they came to America. Some of their desires were controlled by nature and could not be overcome until man had invented ingenuis ways of doing so, but they did realize why settlements would be more advantageous at one place than at another. Cities began as buying and selling centers and places of storage. Men collected in cities for reasons of protection, profit, pleasure, and politics. The sites generally favorable for these activities were at the; 1. junction of river valleys; 2. junctions of water and rail routes; 3. bends of rivers; 4. harbor at the end of a lake; 5. harbor at river mouths; 6. obstruction in the channel of large navigable streams such as falls, rapids, or sand bars.

If one made a study of all the sites that would meet the requirements necessary for the development and growth of a city they

would find the number to be many. It is,therefore, better to study the concrete evidence presented by our present day metropolitan area areas. It is interesting to note why cities are located where they are, what has been responsible for their growth, and what has been the extent of their planning.

"Only one city of importance in the eastern half of the United States (Indianapolis) is located far enough inland to be away from the influence of inland water transportation."--H. G. Moulton. In times of inland water transportation it is evident that nearness to raw materials, power, and labor were first and foremost in the location of a city. After the introduction of the steamengine and the railroad, man was unwilling to move to new sited when the raw materials were exhausted or the supply of cheap power was gone. It was much cheaper to import the elements necessary rather than make a new settlement.

Since the primary concern of this paper is to deal with industrial cities it is appropriate to discuss the factors that control the localization of industry. Among those factors necessary for the proper functioning of an industry are: ease of access of raw materials; the availability of power, which may be in one form or another; an ample supply of satisfactory labor; adequate transportation facilities; successful management of capital; and sufficient land area at a reasonable rate for industrial building. In the city of Detroit industry was stimulated and attracted by the building of new railroad lines, especially so at the junction of several important lines. Steam transportation has made it possible for all cities to grow with amazing rapidity, but in the more recent and important expansion of cities industry has developed so

rapidly that improved transportation has followed rather than preceeded industry.

Whether industries developed first and urban development followed or whether the factories moved into an area already populated, such as Gary, Indiana they will ob in the best land possible for their establishment. Most of our large cities of today became large after industries had been established, thereby making it necessary for the urban population to locate around the industries. If a city is located at the end of a lake or small bay the industries will try to locate in a semi-circle close to the shore line. For a city located near the mouth of a navigable river or along some portion of the river industries will generally occupy both banks next to the waters edge. Many cities so located on rivers are usually traversed by numerous smaller streams thus dividing the land into numerous sections. If industries occupy both banks of the numerous streams flowing thru the city it is evident that they will necessitate the scattering of homes among the various enterprises. Land adjacent to the river is not desirable for homes, but neither is it desirable for homes to be located on the leeward side of industrial districts due to smoke and dirt and the many and varied displeasing odors. These factors of smoke, dirt, odors, moist air, dry air, cold air, warm air, and pure air are controlled to a large extent by prevailing winds of a region. Winds import temperature and moisture from a distance, they bring the effect of water conditions onto the land and carry land conditions off shore. Sultry weather conditins such as high humidity and fog may be destroyed by the mixing of air by winds. As healthful conditions maybe promoted through the aid of winds, so may dust

and micro-organisms, responsible for disease, be transported long distances by winds. Knowing these factors and how to benifit by them is a vital factor in city planning and the definite location of residential districts in regard to such conditions shows a conscious planning on the part of home owners.

During the present age of civilization with its many means of transportation it would be as satisfactory for industrial sections to be located in the western section of a large city as the northern, southern, or eastern. This was not true however in early days and for this reason city planning was only a minor factor not worth considering. Today the problem of rebuilding a city to suit the social, economic, and political needs of the people is to hazardous an undertaking.

Plans have been and are being worked out in many instances to provide for a better social organization, but as yet much remains undone. The city has the power to levy taxes on industry to such an extent that thay cannot realize any profit from their present location, which will eventually force them to new localities. In some such cases industries have moved to new regions to avoid heavy congestion as well as heavy taxation. This is an opportunity for the city to reorganize and carry out plans that could not be accomplished otherwise. Surburban transportation has developed tosuch an extent that it will easily accommodate those working in outlying districts and the people of the city can enjoy more healthful conditions without sacrificing any of the functions carried on by a complex organization of society. Census figures show than an increasing number of people who work in New York City are keeping their residence outside the city itself. The growth of New York

City during the decade 1920-30 increased 23.3 percent while that of the territory adjacent to the city increased 37.6 percent.

Indications are very evident that such great aggregations of population as that about New York City not only render living less comfortable for most of the people in them, but are also less efficient in their economic activities.

The purpose of this paper is to show what steps have been made toward city planning, what possibilities there are for future planning, and how city planning is intertwined with geographical and climatic factors. In making such a study ten industrial cities of Northeastern United States were chosen as examples, some of them are large metropolitan areas and others are smaller mining communities.

The writer is very grateful to Dr. J. L. Page, Dr. W. O. Blanchard, and Dr. H. J. Burgy for advice and counsel given him during this study. Much of the material used in this study was made available by the Chamber of Commerce of the various cities studied.

ST. PAUL

Fort Snelling located at the junction of the Minnesota and Mississippi rivers in 1819 was intended to grow into a thriving area such as Minneapolis and St. Paul of today. This did not prove to be true however for with the establishment of St. Paul in 1840 seven miles farther downstream and the two villages of Minneapolis and St. Anthony located on opposite sides of the river at St. Anthony Falls, Fort Snelling became nothing more than a military post.

St. Paul and Minneapolis attained a population of 18,000 by 1872; 10,000 living in the former and 8,000 in the latter. This fact alone could not assure success in growth and prosperity during the coming years. If population increase was to continue, factors of industrial expansion, increased opportunities for employment and commercial activities had to increase. The centering of railroads serving the middle west was the answer to this problem in the years that followed. The development of railroads meant two things to these two metropolitan centers if they were to maintain sepatation and function and independent units. There must be independence in two railheads, or a railhead in one city and the deterioration of one metropolitan area. With the adoption of two railheads, one in each city, and the distance of 10 miles between the two cores, each city continued to grow and flourish under its own impetus.

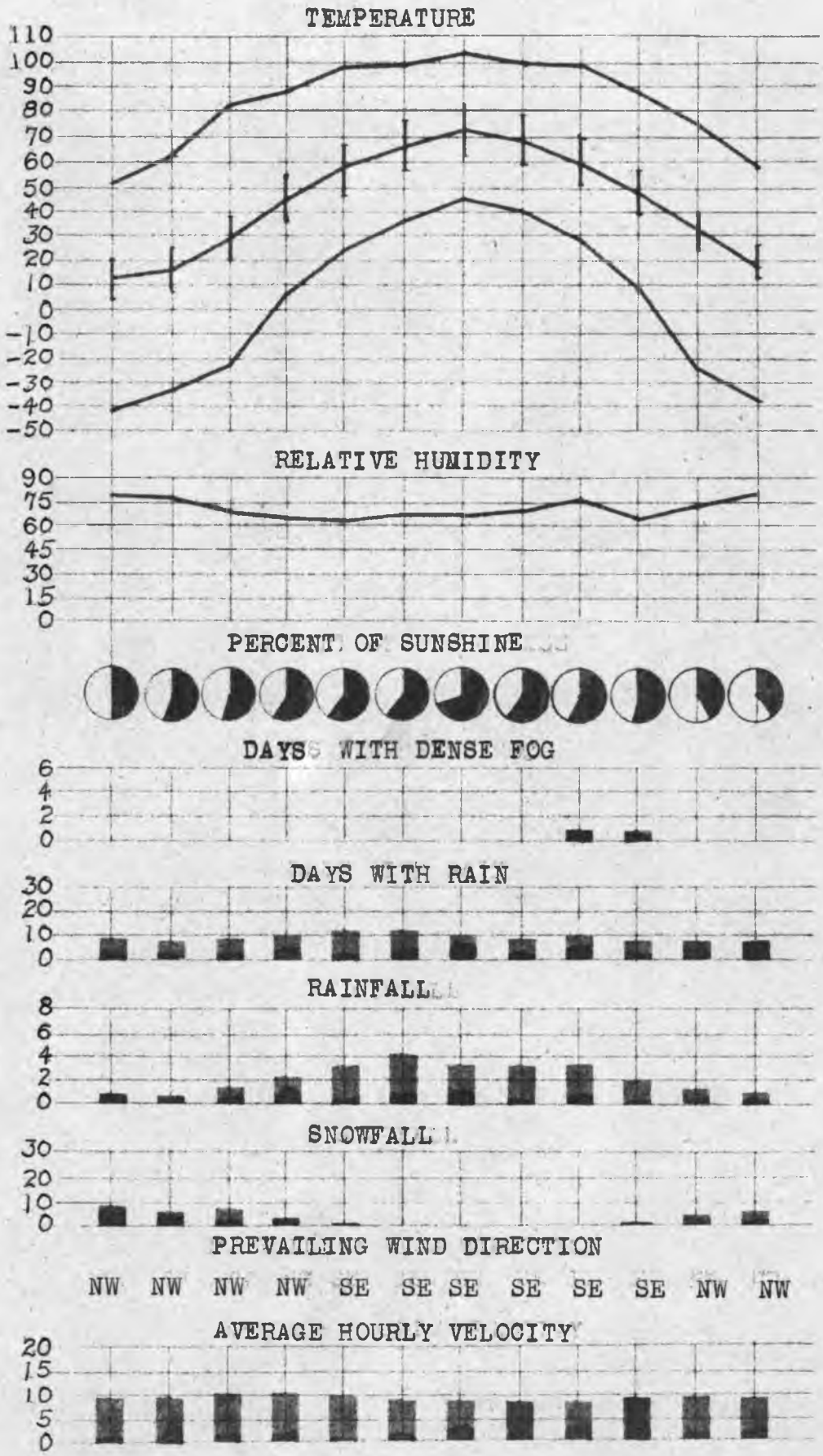
The reason for the development of the twin city area as rail termini rather than some other point 300 miles downstream was governed by the fact that this district was as the head of steamboat

navigation during the early period of development, and it was also the starting point of the main route to the south, southeast, and west. Railroads were planned and built leading away from the head of navigation to the west and to the north as far as Duluth for lake transportation. The glacial plains south and west of the Great Lakes were an inviting and tempting offer to rail transportation.

St. Paul is located at an elevation of approximately 1,000 feet on the outside of a great bend in the Mississippi river some 1850 miles from its mouth. The city is built on bluffs on both sides of the river. The surrounding areas are of the same height and the general slope of the land is from northwest to southeast. Hills, marshes, and small lakes are numerous throughout the area.

CLIMATE -- The mean annual temperature for St. Paul is 44°. The average maximum for the year is 62° and the average minimum is 5°. The highest temperature ever recorded in 105° during the month of July and the lowest is 43° during the month of January. The annual range is much greater at St. Paul than for the other cities studied in this paper, due to its location within the continent and far enough away from water bodies to avoid their modification of climate. It becomes very hot in the summer when the land has reached its highest temperature and in the winter it is subject to cold waves from Canada and the far north. Its location in the high latitudes and the resulting effect from the vertical rays of the sun does much to bring about extremes of temperatures. The days with temperatures of freezing or below are 154 in number and those with temperatures of zero or below total 34.

St. Paul is crossed by many of the storms that follow the most northerly of the three principal storm paths across United



St. Paul Weather Data

States. The fact that storms in this path originate off the coast of British Columbia and pass southward their chances for producing precipitation is not very great. It is true that the colder air is underrunning the warm and more moist air from the south, which on its long journey has lost much of its moisture before it reached the interior of the continent. With a relatively low rainfall there is generally a small number of rainy days, which in St. Paul is 116. Most of the rainfall occurs during the summer and fall months with very little falling in winter and spring with the exception of May.

The prevailing wind direction for the summer months is southeast and for the winter it is southwest. The topography of this region is not favorable for the formation of fogs by air drainage; hence the average number of days with dense fogs for the year is very low. An average of one day occurs for the month of September and October and these fogs are of the radiation type. The land becomes quite hot during the day with considerable evaporation taking place. During the night the drop in temperature due to cooling is large enough to bring about condensation in the form of dew or fog. The fogs commence during the night and are heaviest at sunrise, but usually disappear during the forenoon.

INDUSTRY — St. Paul is definitely a railroad center, employing one fourth of the working male population in car shops, yeards, and terminal offices. Such railroads as the Chicago St. Paul and Minneapolis, Chicago Milwaukee St. Paul and Pacific, Chicago Great Western, and the Chicago Burlington and Northwestern enter the city. Railroads enter St. Paul along the Mississippi and Minnesota flood plain from the southeast and southwest; also along other important

lines that enter from the north, northeast, and northwest to the north bank of the river. Railheads are located for the most part on the north bank of the river, which is more adequate for transferring products from rail to steamer due to the outward swing of the river at this point, which in turn undercut the bluff.

The midway district northwest of the city consists of factories, warehouses, and blocks of workers residences. North of midway on the low moranic hills is a residential district known as St. Anthony Park; politically it is a part of St. Paul although it is much closer to Minneapolis. On the south bank of the river are f factories of various sorts, stockyards, and one of the largest meat packing centers of the world. West central St. Paul is the exclusive residential district of the city.

DETROIT

Detroit, a city somewhat different from other American cities in the respect of age and development, has a past of over two centuries and during all this time there has been constant shifting and planning. The present metropolis bears little resemblance to that tiny outpost of 1701 but there is one influential factor that persists as the years go by. The year of 1805 saw the destruction of this small village by fire. The residents were confronted with the problem of rebuilding the village or moving to a new site. A mass meeting was held and the plan to rebuild was turned over to the Governor and Judges of the Northwest Territory, which included the area about Detroit.

The man credited with the plan for the new city was Judge Agustus Woodward who was familiar with the plan of the city of

Washington. "For the space of thirty days and nights he viewed the diurnal evolutions of the planets, visible and invisible and calculated the course of the blazing meteors. To these profound observations the world is indebted for the discovery of streets, alleys, circles, angles, and the squares of magnificient cities."[1]

The site of Detroit is on the eastern edge of a till plain, sinteen to twenty miles in width, and 550 to 770 feet in elevation; the slope in its eastern portion being only two or three feet per mile. The dominant topographic features of this plain are the results of glaciation. Over much of the area, a thick deposit of boulder clay accumulated in the form of a ground moraine, the upper part of which was leveled to a till plain. Little deposition of rock took place, and what moraines were deposited were of slight relief, and gentle slope. Because of the flatness of the surface and the underlying glacial and lake clay the land is poorly drained, add was originally covered during much of the year with humerous shallow ponds and marshes. The water table of the plain is near the surface of the land; and the three or four small and youthful rivers flood the plain easily.

CLIMATE — Lying in the pathway of the storms that sweep across the Lake region, the climate of this section is characterised by the frequent and rapid changes, which the passage of such storms produce. However the climate is modified to a certain extent by the presence of the lakes which nearly surround the State of Michigan, and while temperatures below zero frequently occur during January and February the cold of winter is not usually so severe, as in districts farther removed from lakes Or other water bodies.

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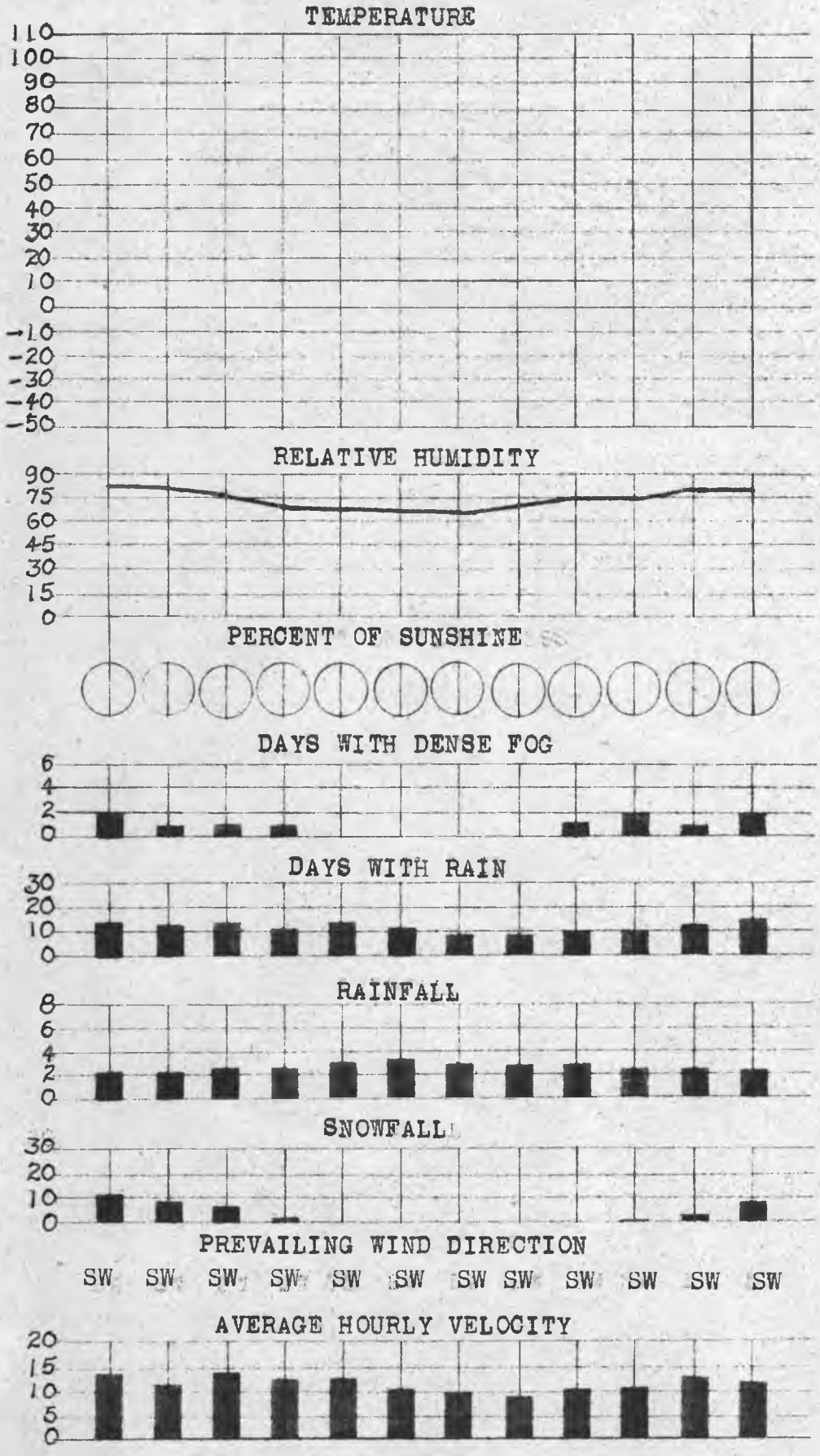
1. Farmer, Silas, History of Detroit, p. 26



Detroit Weather data

The mean annual temperature for Detroit is 48.3°, the mean maximum of 81° occurs in July and the mean minimum of 18° is in the month of January. Five days of the year have temperatures of 90° or above and the highest recorded temperature is 104°. There are 126 days with recorded temperatures of freezing or below at some time during the day and 5 such days with temperatures of zero or below.

The average annual precipitation is 32 inches, the greatest amount 5.68 inches coming in the month of June and the driest month January records 2.1 inches. Rainfall is fairly evenly distributed through the year but the rainfall of winter and early spring is of the drizzle type and much cloudy weather prevails at this time.

The prevailing wind direction for Detroit is southwest for the entire year, a condition that does not occur in any other city studied. Relative humidity, except for the summer months, is exceedingly high for Detroit. The number of days with dense fog total 17 for the year, ranking second only to Pittsburgh which has 23. Fogs occur at all seasons of the year, but are very rare during the summer months. The fogs of autumn are radiation fogs due to the heating of and evaporation from the land during the day and the prolonged cooling during the night, which brings about condensation in the form of fog. In the winter and spring months when the land has cooled to its lowest temperature and is much colder than any air that may be transported from more southerly directions it is possible to have conditions suitable for advection fogs. These occur when warm moisture laden air may come from the south over the snow covered regions of the north. As a result a layer of air of considerable thickness is cooled below the dew point and

condensation takes place in the form of fog.

INDUSTRY - The industry of Detroit has been characterized as being disorderly and unsystematic. The city still clings to that original plan of being eliptical in shape and radiating from the center like the spokes of a wheel. There are four distinct semi-circles, each representing a growth period, and therefore distinct in the building type and the nature of the industries.

The city has many of the same governing facts as other important cities so located on a river, but it is doubtful whether there is any other city laid out in such a manner. During the days of water transportation land was at a premium along water fronts. It is therefore obvious that commercial sites were taken along the river. Since industry came later they were forced to take the outlying areas not already occupied by commercial sites and residential districts. It is at this point of development that the early planning is brought out. The commercial district and residential area followed the semi-circle or radiation idea, which in turn influenced the location of industries in the form of an arc. As houses moved from conjested areas to those of more land and purer air they too tended to follow the line previously formed by the industries.

With the coming of railroads there was not a change in terminal facilities, but they adjusted themselves to the already existing factory districts. Rail transportation caused the districts to elongate along the right of way, so that Detroits original industrial section was by 1870, a long narrow east west strip paralleling the railroads and the river, and breached in the center by the intrusion of a commercial section. Industrial districts in Detroit have multiplied but they have not migrated. The original indust-

rial area along the river front is still devoted primarily to that use, although most of the more prominent industries have been driven, by the shortage of space, into less restricted areas.

The early growth of Detroit was of the two types, that which came through extension of the limits of the older districts farther along the railway tracks, and, that which came through sudden removal of older companies to widely distant new sites. The latter move was in response to congestion and high land values. Since 1870 there has been a suburban trend.

In the early 70's the Michigan Central Railway constructed a new division to Bay City, bringing the new line into Detroit through the agricultural area a mile north of the built up portion of the city. At about the same time the Grand Trunk Railway constructed a line from the St. Clair River to Toledo, also passing through the open spaces just north of the city. The intersection of these two lines and the crossing of a third, the Detroit and Milwaukee, showed promise of strategic location in west Detroit and Milwaukee junction.

There were three definite locations of industry connected with the manufacturing of automobiles. One on the far east side, the Highland Park area in the center of the outer belt line, and the extreme west side. The location on the east side later proved to be inadequate in transportation facilities for handling the vast cargo of iron and steel, which came pouring into the river railway yards. In 1920 the east side plants moved to the far west side. The old river front west side area did not lose out entirely, but was able to attract such factories as the Studebaker Plant and the Timken-Detroit-Axle and Roller Bearing Company. On the west side is located the Paige, Lincoln, and LaSalle Motor Companies and the Seamless

Steel Tubes and the Harwich Stamping Company. Close to the Inner Belt Line and the Milwaukee Junction concentration there is located the Packard, Hupp, Dodge, and Cadillac Motor Company and the Kelsey Wheel Company.

"Practically all the space in the newer industrial districts is devoted to some branch of the automobile industry. Detroits industrial landscape arranges itself in regular semi-circular districts according to relative age and period of development, in both building and type of industry thus conforming very closely to the Von Thuen ideal of city growth. The suburban trend has been rpoduced by factors of congestion, value, and space."[1]

The incentive to move into the suburbs was, originally, to get back to the soil and out into the coutry where there was plenty of sunshine and pure air. The same incentive is still stressed, but w whereas it was possible formerly only for the wealthy and hence the leisure class to remove so far fhommtheir pls e of work, it is now possible for the average man to move out into the surrounding areas and still live within commuting distance of his place of employment. The development in automobile transportation and the suburban trend in industry are equally responsible for this.

AKRON

Akron has been likened to an eagle with wings outspread. The head is represented by north hill, a residential section; east Akron, one of the wings, is a residential and factory section; west hill, the other wing, is the best industrial section; south Akron

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1. Thomas, Jerome G., The City of Detroit, p. 121

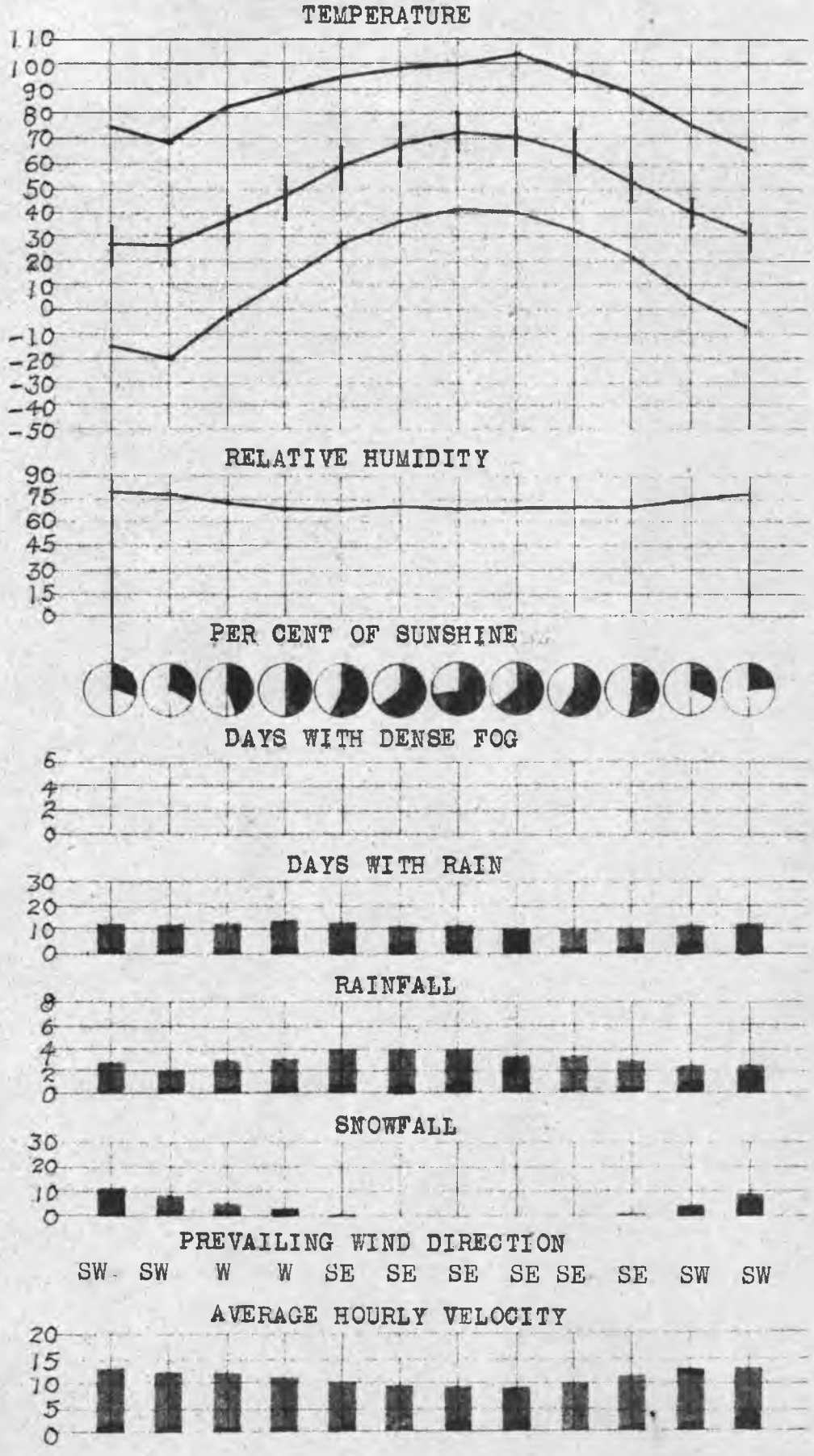
representing the tail, is the great industrial district; and the body is characteristic of the downtown business section.

The city of Akron is divided into three units by the Little Cayahoga River and the Ohio Canal. North of the city is Cayahoga River with its falls. A short distance west of the falls the Cayahoga is joined by the little Cayahoga which flows from the south. Paralleling Little Cayahoga through the northern half of the city then extending northeast southwest is the Ohio Canal, which marks off the third section of Akron. The west section of Akron, called west hill, and the east section of Akron both rise some 300 feet above the river, while south Akron is even higher. North Akron is 100 feet below west hill and east Akron. Uplands extend some distance east and west and the narrow valley of the Cayahoga trends in a northeast southwest direction from Akron to Lake Erie. Some distance south of Akron is the Muskingdom River Valley which joins the Ohio, thus furnishing a route to the Gulf States.

The climate of Akron is almost a perfect correlation with that of Cleveland and will not be discussed in connection with Akron. The slight modifications that do occur in the vicinity of Cleveland are brought about by the presence of Lake Erie.

The Cayahoga with its gorge and the narrow and broken valley walls present a difficult problem to the activities of the city. The business district is bounded by steep slopes on the north, east and west. To avoid steep grades and provide an easy outlet for the business district viaducts have been constructed connecting the residential hills with the valley.

The industries of Akron are many and varied. There are over 300 manufacturing establishments and the three largest groups of



Akron Weather data

industries are those engaged in the manufacture of rubber goods, clay products, and cereals. Some of the more important factories are:

American Tire and Rubber Co.
Goodyear Tire and Rubber Co.
Firestone Tire and Rubber Co.
Lyon Rubber Co.
Quaker Oats Co.
Duro Brick Co.
Ohio Stone Ware Co.
Summit China Co.

The rubber industries employ approximately 58,000 workers, mostly skilled and semi-skilled, whose pay is such as to permit them to afford comfortable homes in which to live. Due to the early selection of sites best suited from a transportation standpoint the large plants are now handicapped for expansion possibilities. The clay products concerns on the other hand own large acreages, which they may occupy at their convenience. Following the railroad and the facilities they afforded led to the location of industries in valley lines throughout the city. However a large share of the heavy industries are located on the south side of the city with lighter districts in east Akron and west hill. Those located on west hill are near the business center, as west hill is regarded as an exclusive residential district with homes located on the higher land more free from smoke. See fig. ( )

The business district is not so fortunate in its location as the prevailing wind is from the south and southwest during the greater part of the year; carrying smoke and dirt over the district, causing the city to appear, which it really is, dark, dingy, and dirty. As a result a great loss is brought to storekeepers and merchants.

Plan prepared for
AKRON
CHAMBER OF COMMERCE
CITY IMPROVEMENT COMMITTEE
FRANK H. ADAMS, Chairman
by
JOHN NOLEN CITY PLANNER
HARVARD SQ. CAMBRIDGE MASS.

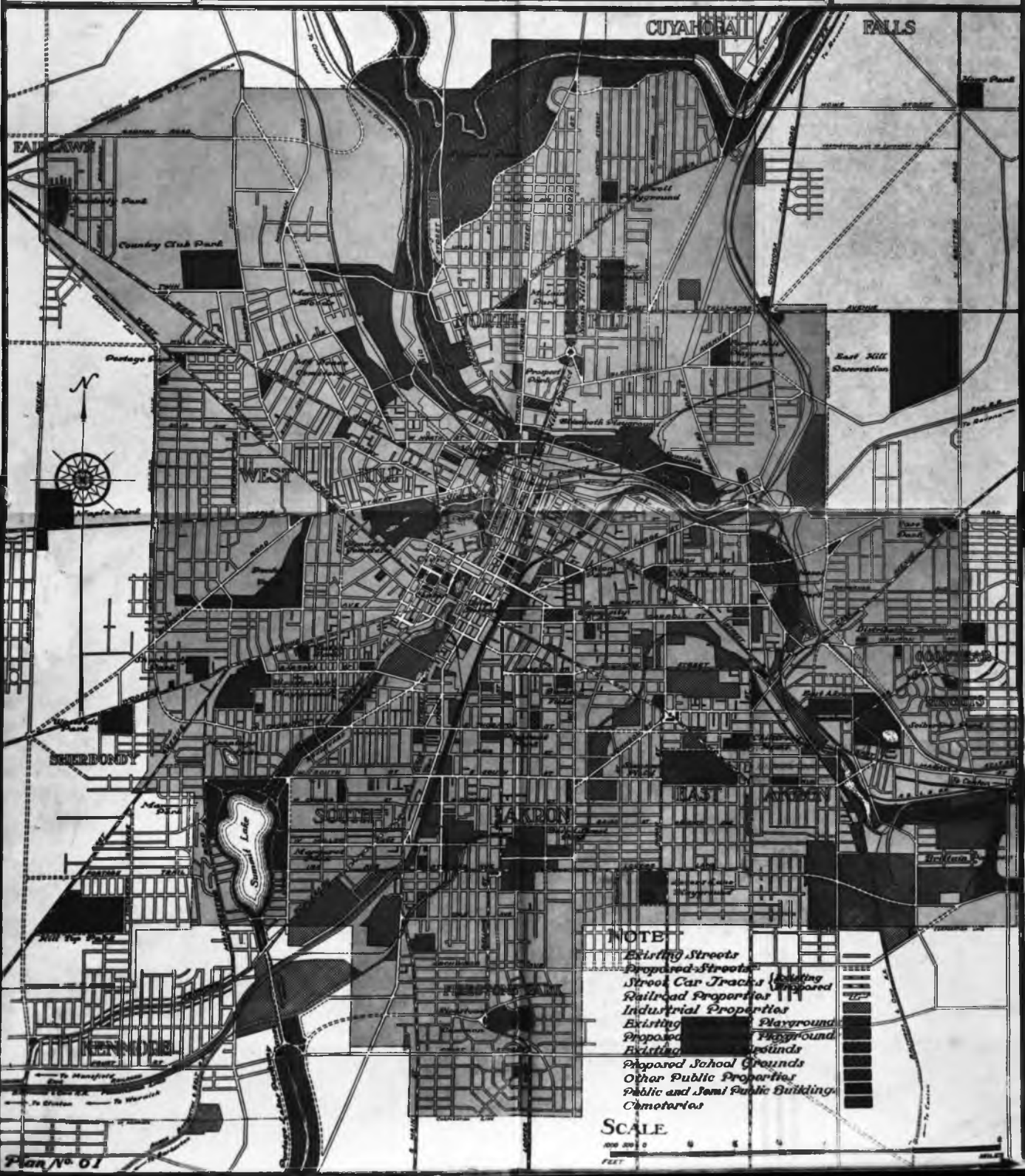
CITY OF AKRON

SUMMIT COUNTY STATE OF OHIO

1919

GENERAL PLAN

Showing
Street & Park Systems
Public Building Sites
and other
City Planning Features



Plan No. 61

CLEVELAND

Settled in 1796 and incorporated as a village in 1800 Cleveland grew only slowly until the opening of the Ohio Canal as far as Akron in 1827. By 1832 the canal was completed to the Ohio River and Cleveland became the natural meeting point for iron ore from the Lake Superior region and coal from Ohio, Pennsylvania, and West Virginia. Cleveland located at the mouth of the Cayahoga lies at the focus of three main routes. The valley of the Cayahoga forms the only natural gap in the shale cliffs that skirt the southern shores of Lake Erie. The north and south extension of the Cayahoga River Valley reaches the head of the Muskingdom Valley forming an outlet to the Ohio and Mississippi Valleys. Railroads serving the eastern seaboard from the western states followed the shores of the Great Lakes to take advantage of sandy well drained beach ridges, but these beaches converged at the Cayahoga River Valley, which rendered it very favorable for the location of a city.

The only surface irregularities in the level land of Cleveland are due to the erosive work of the Cayahoga River. It has cut a valley 60 to 125 feet deep in the glacial till and sand of this area. The river pursues a sharp winding course through a valley about one-half mile wide, which is broken by several smaller streams. The river and its tributaries flowing into Lake Erie have divided the city into various sections, thus making it difficult for transportation and communication with all parts of the city. At places along the shore thare are elevations of 75 feet above the waters edge with a gradual rise toward the southeast to 115 feet and on the extreme east to more than 600 feet.

CLIMATE -- The annual mean temperature for Cleveland is 47^{o} with

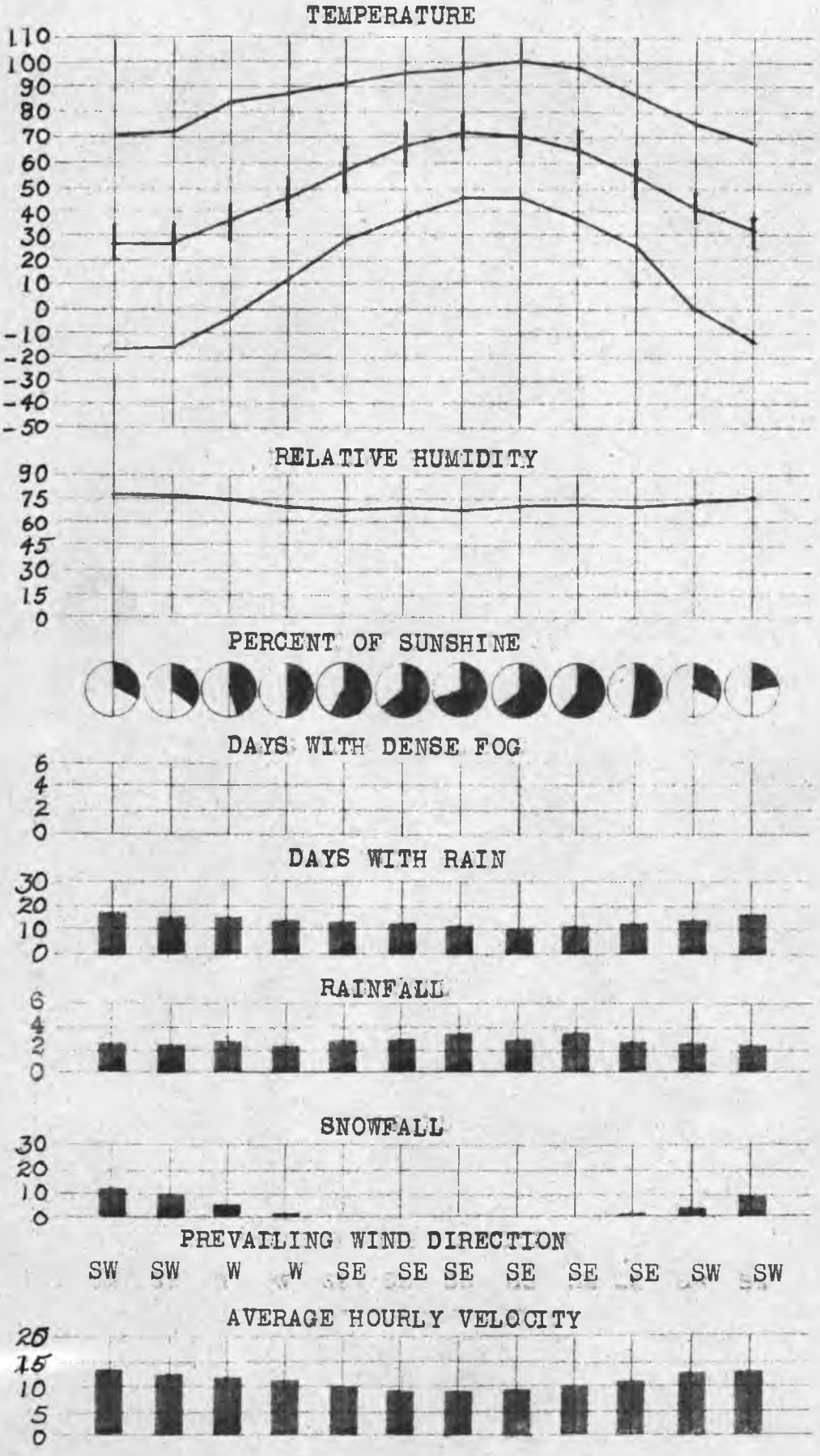
average for the warmest month being 71° and for the coldest month 28°. Although the temperature curve does not bring out the results in a noticeable form it is true that Lake Erie modifies the temperature to an appreciable extent. Temperatures seldom reach 100° during the summer and only on 3 days of the year does the temperature fall below zero. Another striking effect of the lake may be noticed when cold waves sweep in from northern Canada attended by low temperatures. At these times the difference in temperature between the north and south side of the lake frequently amounts to 20° or more. Land that slopes toward the west or northwest receives a greater moderation of temperatures than those of other inclinations, because these areas receive full benefit from the winds blowing across the lake. In late spring and summer these winds will be cooled by the water, but in the fall and early winter such winds will be warmed by the water.

The average annual precipitation is 36 inches. July and September each with 4 inches are the wettest months of the year. The large number of rainy days (18) with .01 inch or more of precipitation for January and December accounts for the low percentage of sunshine during the winter and early spring months. The number of rainy days for the year is 165.

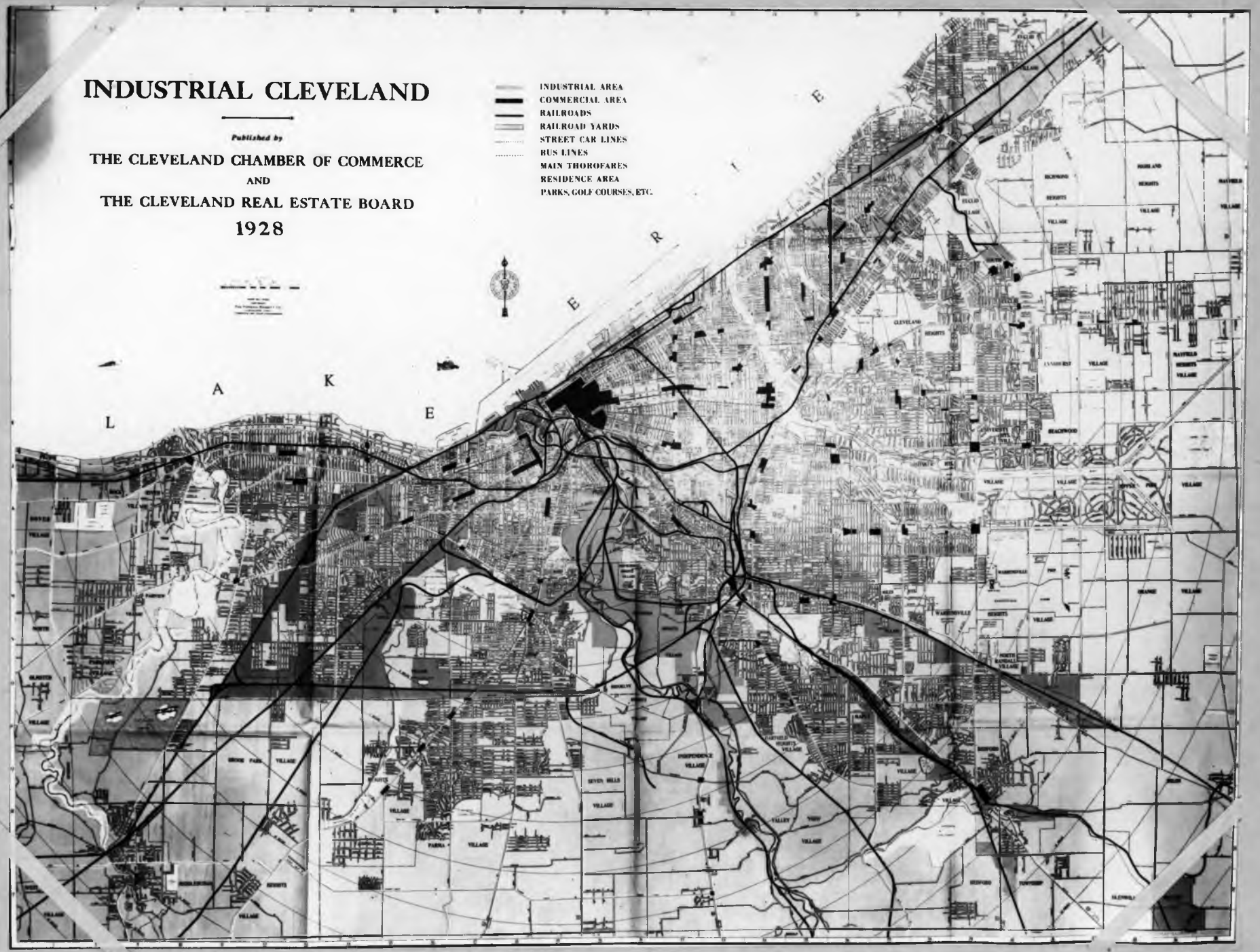
The prevailing wind direction during the summer months is southeast, during the winter months it is southwest and for March and April it is west. The various directions are due to the rearrangement of pressure centers during the course of the year.

INDUSTRY -- The valley lowlands are crowded with blast furnaces, steel mills, lumber mills, and chemical plants for several miles back from the lake to take advantage of the lake and land traffic.

(3)



Cleveland Weather data


INDUSTRIAL CLEVELAND
Published by
THE CLEVELAND CHAMBER OF COMMERCE
AND
THE CLEVELAND REAL ESTATE BOARD
1928
INDUSTRIAL AREA
COMMERCIAL AREA
RAILROADS
RAILROAD YARDS
STREET CAR LINES
BUS LINES
MAIN THOROFARES
RESIDENCE AREA
PARKS, GOLF COURSES, ETC.
L A K E
E R I E

Heavy manufacturing districts are located in Cayahoga Valley along the railroads entering the city from the southwest and also along the south shore of Lake Erie. Residence zones are interspersed among the manufacturing districts, but the more modern and exclusive districts are located in the central and southern portions of east Cleveland. Since the prevailing wind direction for the year is southeast it will carry the smoke and dirt away from these districts. Druing two months of the year, March and April, the prevailing wind direction is west, which will cause half of the city to be smoky, but even then most of the residential districts will be free from smoke.

With the exception of the Lake Erie and Pennsylvania Railroad all other railroads skirt the southern shores of the Great Lakes in passing from the Eastern seaboard to the North-Central States. A large percentage of the commerce of Cleveland is carried by boat since one-half the value of manufactures is composed of iron and steel, and goods made of iron and steel. Cleveland has outrivaled all other Lake Erie ports in the iron and Steel industry. Besides iron and steel importance must be attached to the amount of lumber and grain that is handled and to the manufacture of automobiles. Cleveland ranks second only to Detroit in the manufacture of automobiles.

PITTSBURGH

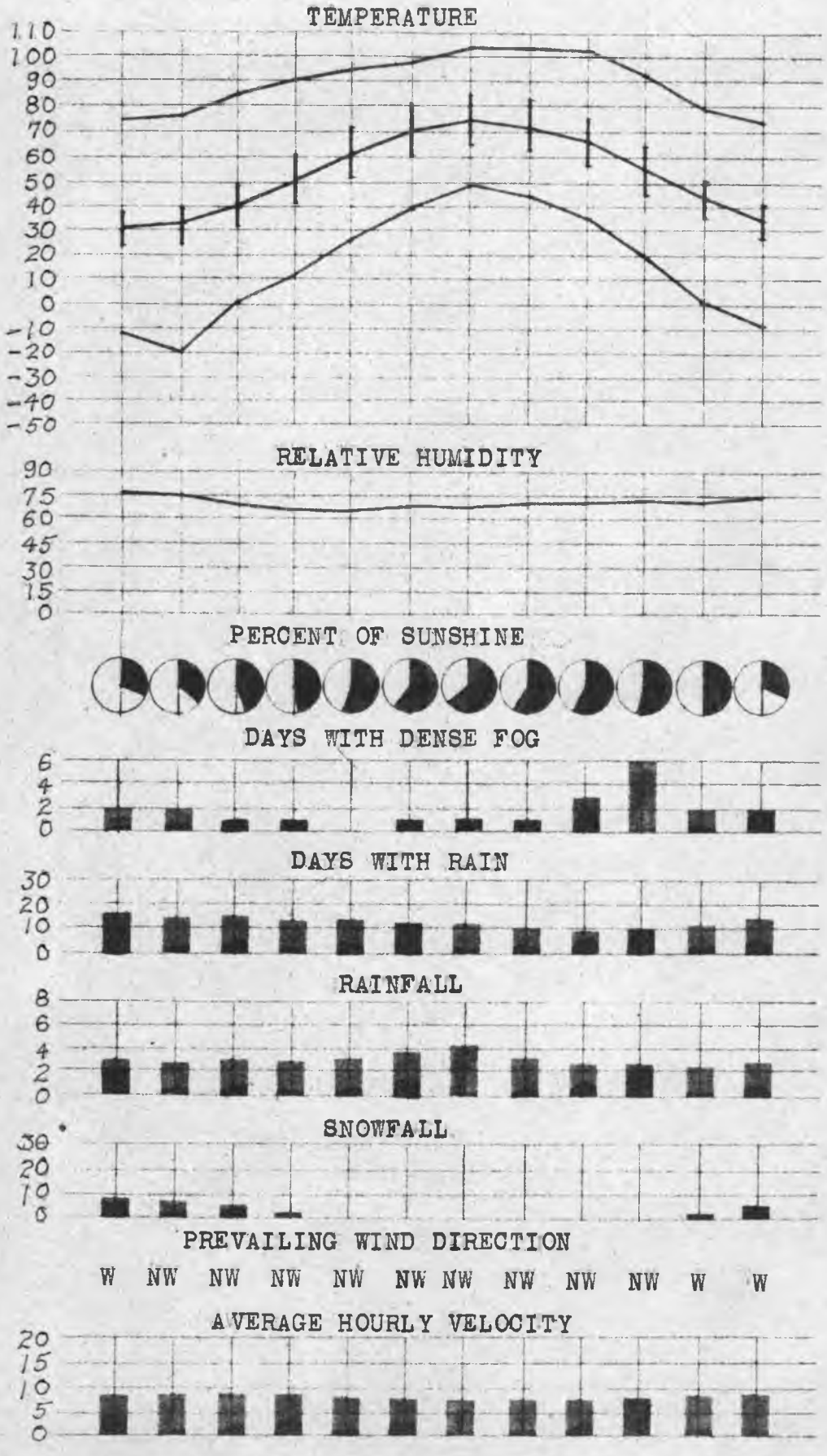
Pittsburgh was chartered as a city in 1816. Boatbuilding had begun as early as 1797 and by 1806 the manufacture of iron was well established and by 1825 had become the leading industry. The canal from Pittsburgh to Philadelphia built in 1834 greatly increased the

commercial importance of the city.

The tongue of land formed by the confluence of the Allegheny a and Monongahela Rivers together with some adjacent territory is the present site of Pittsburgh. The major portion of the city is on the ridge formed by the Allegheny and Monongahela Rivers, but considerable development has taken place on the bluffs on the opposite banks of the rivers. The Allegheny plateau is in the mature stage of the topographic cycle while the three rivers are in late youth or early maturity. Various tributaries of the rivers are in youth. The plateau ranges from 1,000 to 1,200 feet above sea-level and 200 to 300 feet above the river level. The various direction taken by the three rivers as they wind their way through the plateau makes them susceptible to climatic influences; in the determination of wind direction, wind velocity and air drainage.

CLIMATE -- Pittsburgh and its surrounding territory is subject to somewhat lower temperatures and to more frequent and sudden changes than occur in the remainder of the state. The mean annual range of temperature is 53°. The average for the warmest month is 74° and for the coldest 30°. Sixteen days of the year show temperatures of 90° or above and there are some days with temperatures above 100°. Winters are moderately cold, there being an average of 98 days with temperatures falling to or below freezing and 3 days with temperatures below zero.

The average annual precipitation is 36 inches with the maximum falling during the summer and the wettest single month (July) receives 4.2 inches. Precipitation occurs as a rule in small amounts and at frequent intervals. Rainfall in excess of 2.5 inches in 24 hours is comparatively rare. Days with recorded rainfall of .01



Pittsburgh Weather data

inch or more total 154 with 15 days each for December, January, and March. The small amount of sunshine received in comparison to other cities studied must be explained by the large number of dense fogs occuring during the year with a greater number of lighter fogs and also much smoke and haze. Dense fogs occur on 23 days of the year; every month except May having some. The greatest number occur during October when conditions prevail for radiation fogs. The drainage of air into the valleys shortly after sunset is slow enough for the air to radiate heat as it descends and then on reaching the valley floor it radiates heat still further, consequently the temperature falls low enough for the air to reach the point of condensation, which takes place first in the form of dew. As the layer of air below dew point increases in thickness it becomes fog. With the addition of an abundance of smoke and dust particles fog is more likely to form than it otherwise would even if air conditions were suitable.

The prevailing wind direction is northwest nine months of the year and west during November, December, and January. The wind velocity is lower than for most of the other cities studied and this factor together with higher summer temperatures produces uncomfortable conditions at times even though the humidity is only 68 percent.

INDUSTRY -- Pittsburgh like many other industrial cities, occupying valleys hemmed in by ridges, terraces or mountains and broken here and there by tributary streams, has made the most of its possibilities by using all the available lowlands and water frontage. In such cases the residential districts have not been able to escape the annoyances and unhealthful conditions of a "Smoky City".

The more attractive residential districts are on the plateau in the eastern portion of the district between the Allegheny and the Monongahela Rivers and on the hills overlooking the Allegheny River from the north.

The proximity of coking coal, a supply of natural gas and adequate river transportation renders Pittsburgh the opportunities for being the steel and glass making center that it is. Another factor figuring in the prominence of Pittsburgh is its location midway between raw materials and the market for manufactured goods coupled with the exonomy of investment, which makes it cheaper for the steel center to remain where it is rather than move to a new site.

SYRACUSE

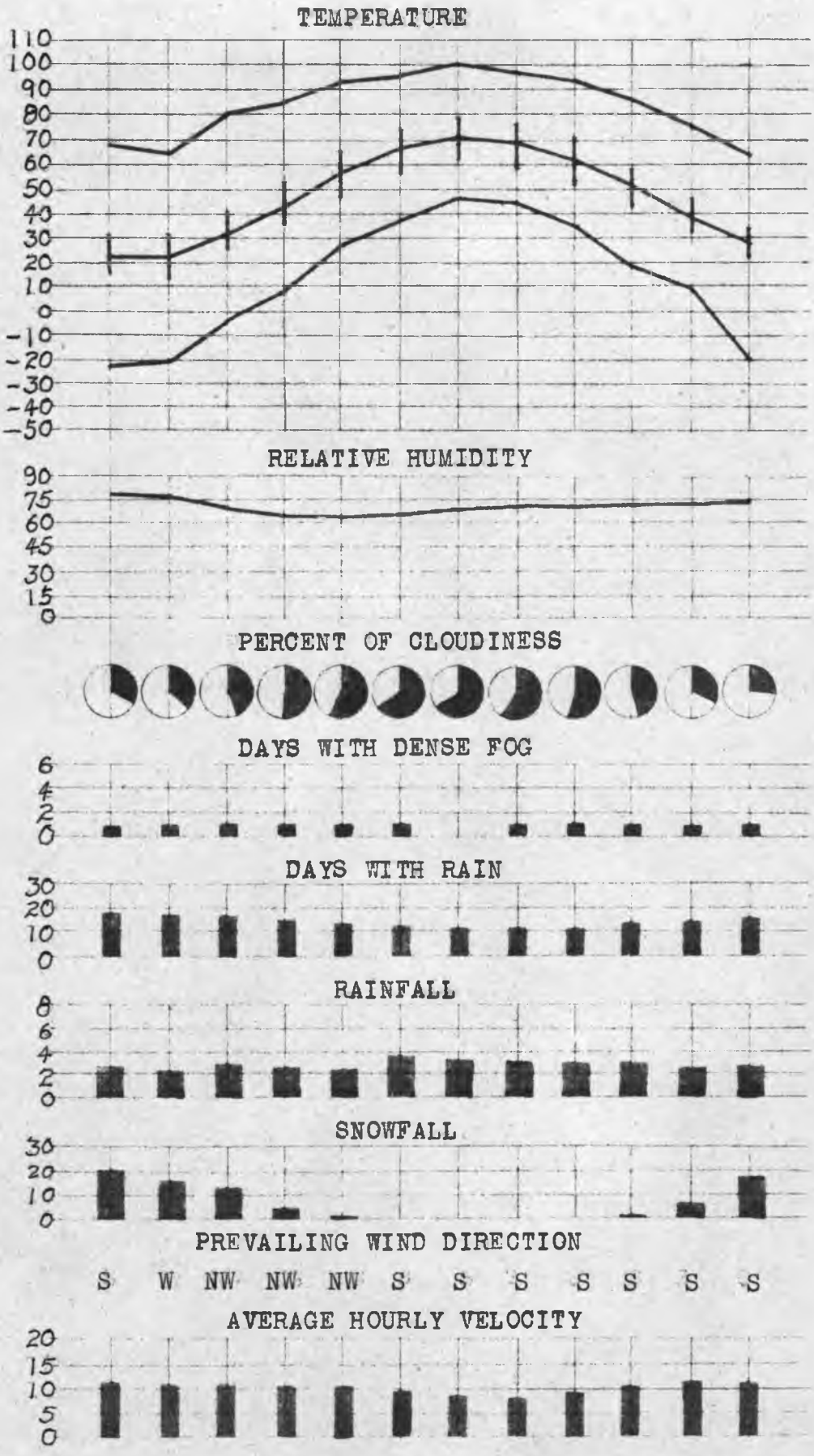
The Syracuse region became known to Europeans through its salt deposits. Every summer numerous small companies would visit the region to work the deposits and in 1796 the first permanent settlement was established. In 1806 a grist mill and a saw mill were built. For many years Syracuse held first rank as a salt producer, but with discoveries in Michigan and Wyoming she was forced to the background. The early beginning of this industry paved the war for one of more importance; that of the manufacture of soda-ash and today Syracuse has the largest plant in the world. Soda-ash or sodium carbonate is used in the manufacture of soap, paper, glass, medicine, and photography.

Syracuse is located on Onondaga Lake on the New York Central and Hudson Railroad. The city is built on high ground in an amphitheatre of hills surrounding the southern end of Onondaga Lake.

The land slopes from the southwest to the northeast with relatively flat lands and swamps to the north while hills and small stream valleys stand out on the west, southwest, and south side of the city. Onondaga Creek entering at the south end of the lake passes through the southwest quadrant of the city. A small section of Syracuse is east of the river, but three fourths lies to the west and northwest. There are no bluffs on either side of Onondaga Creek to seriously hinder the expansion of industry or residence building. The location of Suracuse with reference to the Mohawk Valley is a factor that greatly affects climatic conditions; most of which will be air drainage, wind velocity, wind direction and the number of cyclonic storms, which in turn will affect total hours of sunshine and temperature. These factors will be discussed under climate.

CLIMATE -- Syracuse in the finger lake region of New York has its climate modified to some extent by topography and water bodies. The temperature ranges from 70° in July to 24° in January with a mean annual temperature of 47°. Highest temperatures occur in July, frequently reaching 95° and occasionally 98°. Days with temperatures below freezing total 120 and those below zero are 4 in number. Nearness to the Great Lakes and smaller Adjoining lakes plus a pregailing wind direction from the northwest during March, April, and May accounts for the modification in temperatures during the spring.

The mean annual precipitation is 36 inches with the maximum amount,3.8, inches coming in the month of June and the least amount 2.5, inches in the month of November and February. Rain occurs on 167 days of the year the large number being due to the location of



Syracuse Weather data

Syracuse in the path of the westerlies and, to some extent, being east of Lake Ontario. Buffalo in the same vicinity but closer to the lake receives rain on 170 days of the year. These observations account for the small amount of sunshine that is received by the city. During November, December and January only 25 percent of the possible amount of sunshine is received.

Dense fogs occur on an average of 11 days during the year and the number would undoubtedly be higher if night winds occuring on Lake Onondaga did not carry the air northward across the lake. The night wind is a local phenomena and occurs during the summer months when settled weather prevails and the absence of general cyclonic disturbances give full play to local influences. It usually sets in two or three hours after sunset, first as a light breeze but gradually strengthens until a velocity of about 8 miles per hour is reached. The current has its origin on the hillsides at the southern end of the lake and flows northward. As it moves over the level surface of the lake it is augmented by the cool currents which join the main stream through the numerous gorges and water courses that enter the valley from either side.

The prevailing wind direction for most of the year is south, but for the month of February it is west and for March, April, and May it is southwest. The average velocity for the year is 11 miles per hour and for the winter months it is slightly more than 12. These velocities during the summer with low humidity makes living conditions very comfortable.

INDUSTRY -- Syracuse is one of the few and without question the best example of city planning. Whether it be conscious planning to fit climatic conditions would be very hard to prove but various

evidences favor that view point. Industry is consolidated into one solid band running in an east west direction until it approaches Lake Onondaga and here it changes to southeast-northwest. The area near the lake is several times wider than that which transgresses the city. Six hundred acres of land on the lake front is wholly taken up with the manufacture of salt and soda ash products; an industry developed from the early salt mining. This area is excellently served by various railroads which include the New York Central and Hudson, West Shore, Delaware-Lackawana and Western, and the Rome Watertown and Ogdensburg Railroad.

Power from Niagra Falls is used by the city and manufactures are extensive and greatly diversified. Men and womens clothing, foundry and shop products, iron and steel, automobiles, and sewing machines constitute the main articles manufactured.

ALBANY

Albany is located on the west bank of the Husdon River just below the mouth of the Mohawk River and Lake Champlain Canal. Fort Nausau built on Castle Island opposite Albany by the Dutch or Walloons in 1648 was the early stage of modern Albany.

Its location at the junction of the Mohawk and Hudson River Valleys eliminates a few disadvantages common to most river cities. Valley walls are not so pressing nor is the land at such a premium along the river front. The fact that Albany can expand greatly along the Mohawk Valley toward the northwest has permitted the city to do so without crossing to the opposite bank of the river. This renders a big handicap to cities so located due to inadequate river crossings and an unbalanced growth. The growthof Albany does

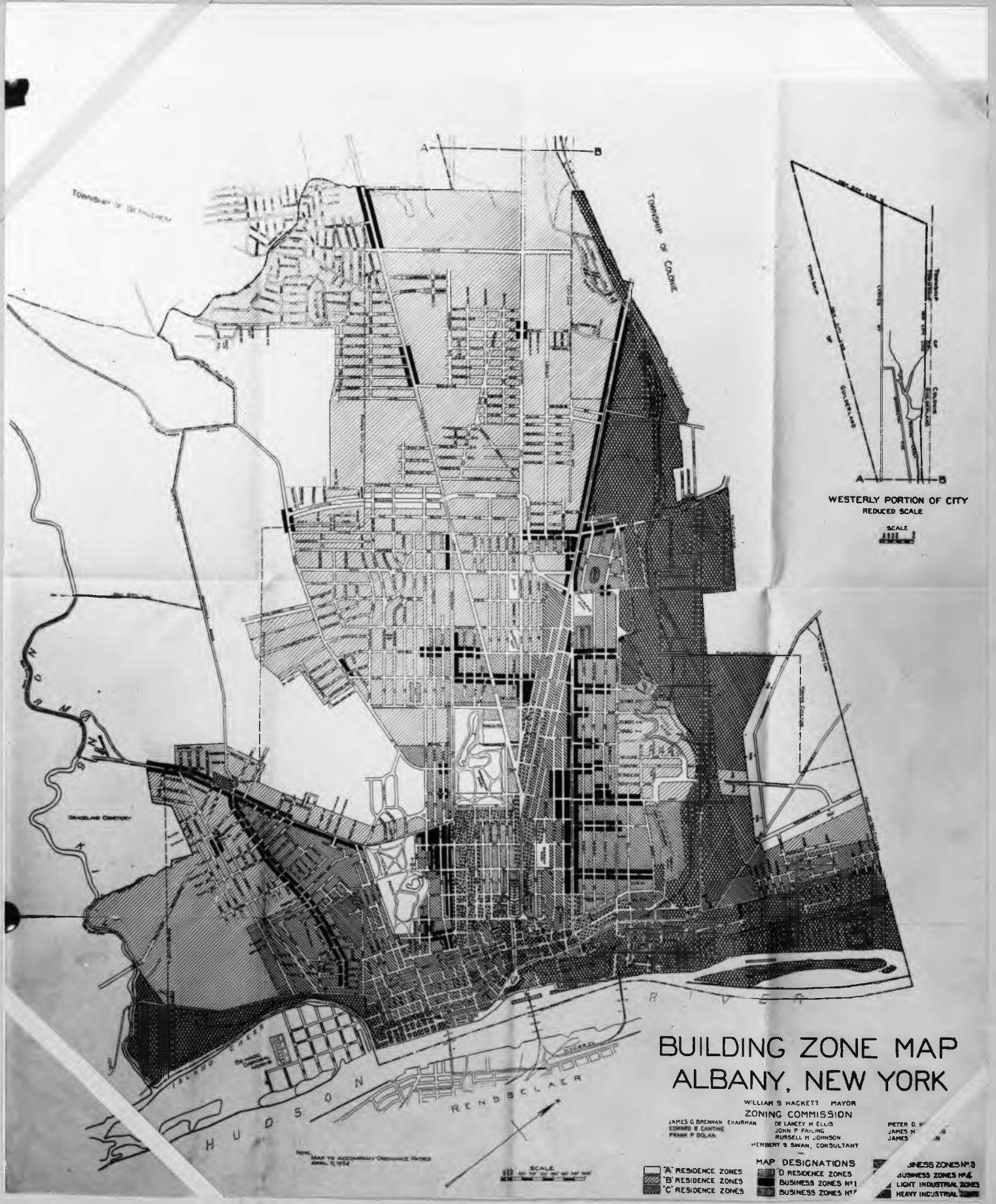
encounter land features on the south that detract from commercial locations due to the valleys and bluffs of various streams entering the Hudon Valley/

CLIMATE -- The mean annual temperature is 48° with a mean temperature of 74° for July and a mean temperature of 24° for January and February. The number of days with temperature of 90 or above totals 8 for the year, which is the same as St. Paul located somewhat farther north. There are 126 days of the year with temperatures of freezing or below and 9 days with temperatures of zero or below.

The mean annual precipitation for this region is 33.6 inches. The maximum is not confined to any one month but to the months of June, July, and August with 3.5 inches for each month. January is the month with lighest rainfall receiving only 2.3 inches, while the number of rainy days for this month (13) is more than any other month.

The prevailing wind direction being south for all but three months of the year explains in part the high humidity that prevails in this region, but the uncomfortable effects that might be felt are offset by low summer temperatures.

Dense fogs occur on 15 days of the year. October has an average total of 4 while April, May and June show no fogs recorded as dense fogs. The month of October is suitable for radiation fogs, especially in river valleys or near small lakes. The land is heated to a fairly high temperature during the day and much water is evaporated due to the presence of water bodies. At night or shortly after sunset the air cools rapidly and in so doing it reaches the point of condensation. If the fall in temperature is low enough condensation takes place in the form of fog and if not then



BUILDING ZONE MAP
ALBANY, NEW YORK

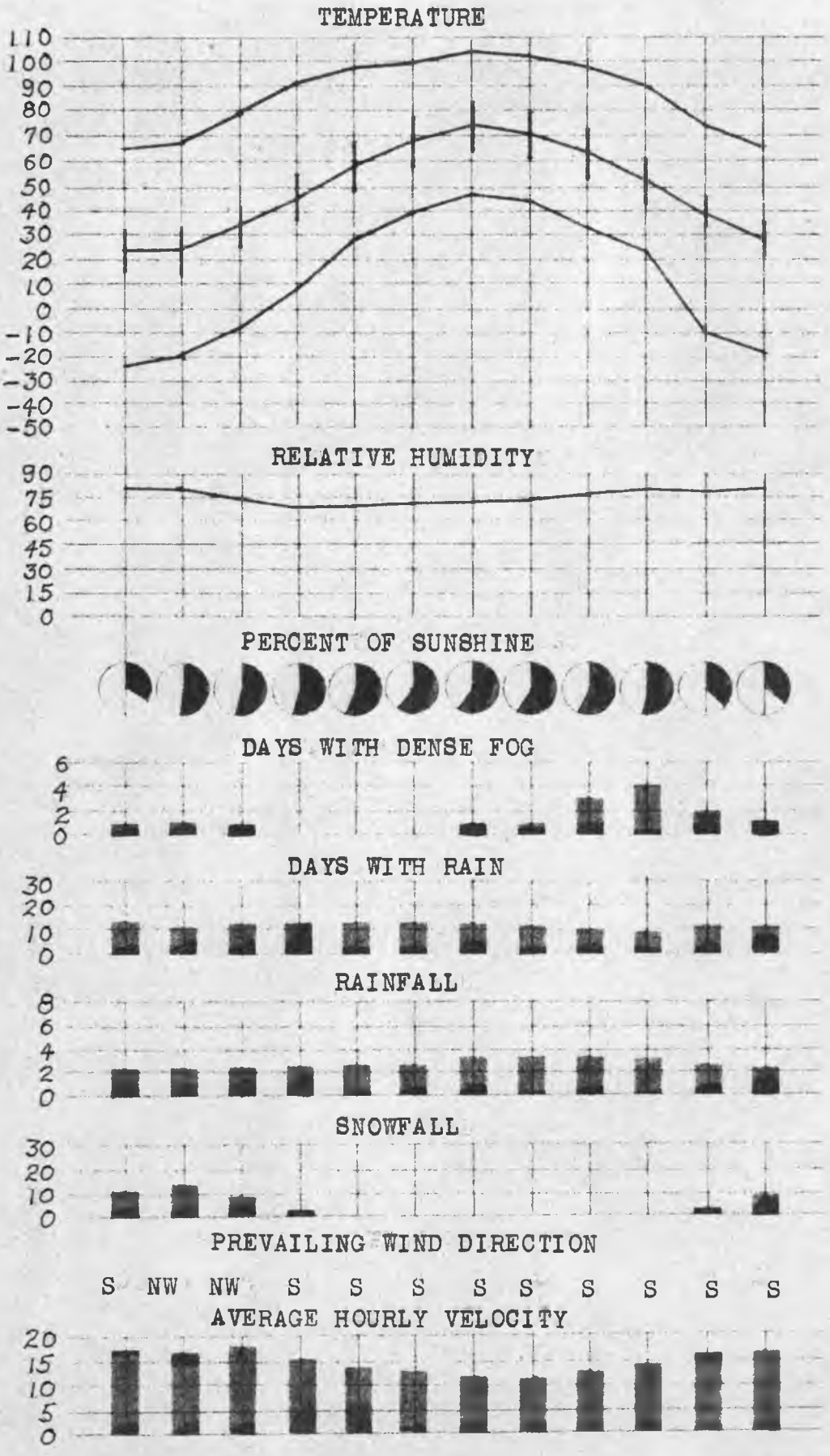
WILLIAM S HACKETT MAYOR

ZONING COMMISSION

JAMES G BRENNAN CHAIRMAN
EDWARD B CANTINE
FRANK P DOLAN
DE LANCEY M ELLIS
JOHN P FAILING
RUSSELL H JOHNSON
HERBERT S SWAN, CONSULTANT
PETER D. [illegible]
JAMES H [illegible]G
JAMES [illegible]N

MAP DESIGNATIONS

'A' RESIDENCE ZONES
'B' RESIDENCE ZONES
'C' RESIDENCE ZONES
'D' RESIDENCE ZONES
BUSINESS ZONES No 1
BUSINESS ZONES No 2
BUSINESS ZONES No 3
BUSINESS ZONES No 4
LIGHT INDUSTRIAL ZONES
HEAVY INDUSTRIAL ZONES



Albany Weather data

heavy dew is formed.

INDUSTRY -- There is a definite line of industrial location both along the river front and also along the four track line of the New York Central and Hudson Railroad. The junction of this water and rail route forms a right angle area, within which Albany is concentrated. There is only one choice for residential building to follow and that is to expand southward away from the river and westward along the New York Central railway lines.

The exclusive and finer residential districts are located south of the first class business section and in the western one-third of the city. This location is the best possible from the standpoint of odors and smoke from the industries of the city. During no month of the year is the prevailing wind direction such as to carry smoke from the industries to the residential districts.

SCRANTON

Scranton was first settled in 1756 by colonists from Connecticut They entered the present site of Scranton by way of Nay Aug Gap after leaving the Delaware River. The junction of Roaring Brook and the Lackawana River was decided upon for the suitable site for the location of a grist mill. The mill proved satisfactory and drew prospective farmers from 20 miles around. See Fig. ( )

The finding of iron ore outcrops along the stream banks was the beginning of a small furnace and forge for the manufacture of plow shares. The expense proved too great however and the industry died out. A short time later the distillery and grist mill were closed and the small village sank into oblivion. In 1839 the village was revived through the discovery of anthracite coal along the

stream banks and the promising amount of iron ore. The coal was found in ten foot seams and was within a few yards of the iron-ore. The ore in the immediate vicinity proved to be too costly for mining, but a new vein was discovered on the slopes of the Moosic Mountains. The iron industry continued at a slow pace until the year 1846. "At this time the Erie Railroad placed an order for 12,000 tons of iron rails an order of great signifigance to the Scranton Company."[1]

With this assuring outlook the city began its rapid growth and development. The continued increase in the shipping of iron products to the east raised the important problem of adequate transportation. Most of the products were to be sent to the eastern seaboard and thus far the means of transporting had been by canal and wagon. In 1852 the plan was carried out for the construction of a railroad through Nay Aug Gap to connect with the Central Railroad of New Jersey, which would give an all rail route direct to New York City. In 1856 the road was completed and the east and west roads of Scranton were consolidated under the name of Delaware Lackawana and Western. The two great factors that saved and promoted the growth of Scranton were the Lackawana Iron and Steel Company and the Delaware Lackawana and Western Railroad. With every new location of an additional company new routes and railroads were promoted to serve the city of Scranton and thus we find the development of an industrial site definitely established and the population trend to be an increasing one for many years to come.

The city extends to a distance of 5 miles along the valley floor

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1. Zierer, C. M., "Scranton As An Urban Community" Geog. Review Vol. 17, p. 427

and 3 miles in a lateral direction. The topographic restrictions make it necessary for the growth of the city to take a long and narrow form or else occupy the slopes, ridges, and terraces leading up the mountain sides. The former condition has been followed although the city occupies a series of terraces and several minor ridges to a distance of 400 feet above the lowland. 1,400 feet above the valley floor one is impressed by the tree covered mountain ridges which border the major valley. The succession of parallel ridges is broken only by Nay Aug Gap on the east and Leggetts Gap on the west and the few, but well situated, antecedent streams that cut through the mountains. Railroads have taken advantage of these natural routes and have built lines running east and west from the city, which adds much to the value and importance of Scranton as an industrial town.

Commercial conditions are handicapped to a great extent by the topography of the region. The soil is low in fetility and the intensity of the mining operations within the valley have made it practically devoid of all vegetation. Traffic through out the city is mainly in a north south direction following the valley; what few streets that do run east and west have very steep grades and must be built across ridges and valleys. The river interferes with commercial activities since the city occupies both sides of the river. To eliminate some of the difficulties bridges have been built at the more important places of crossing.

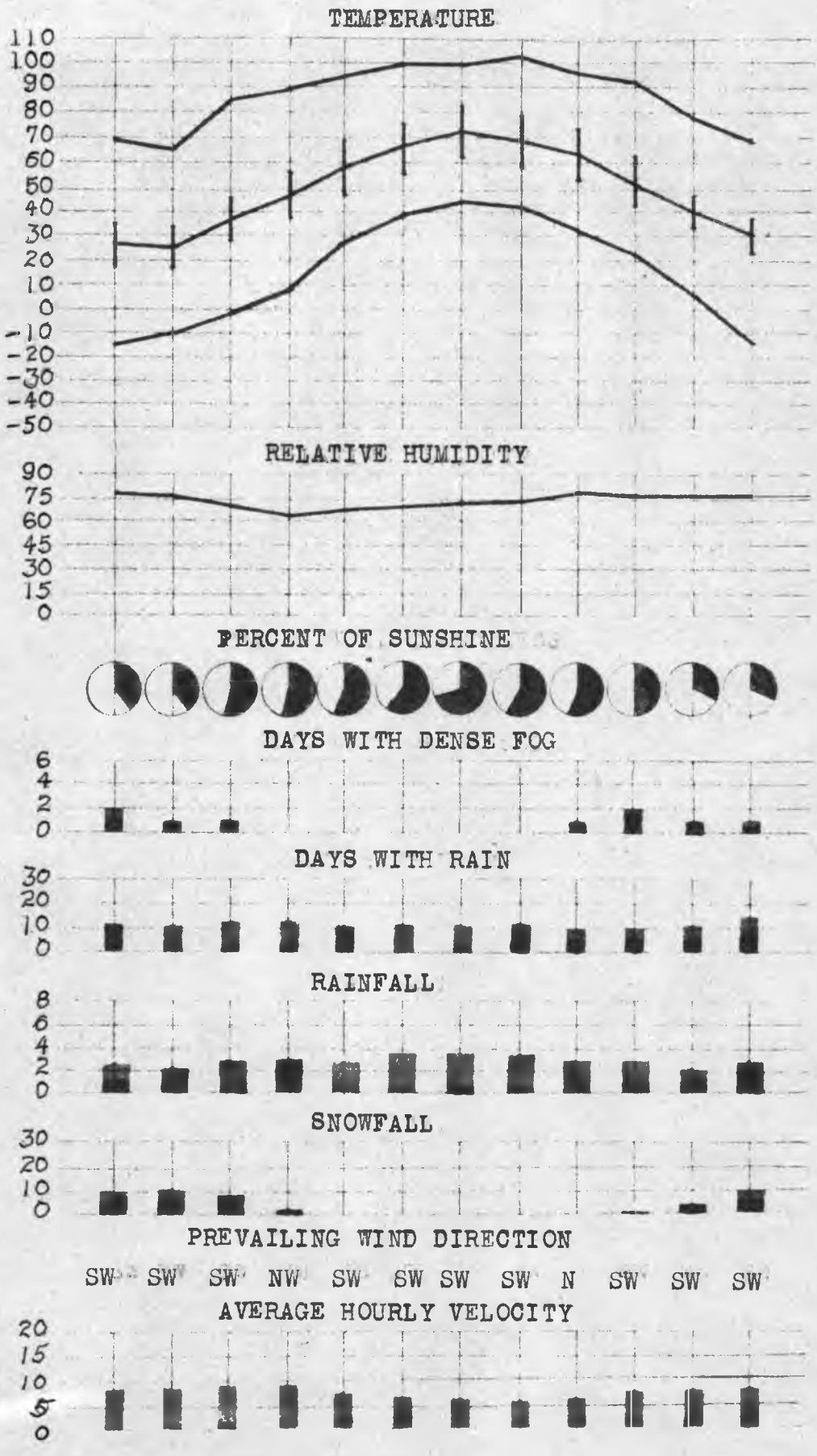
CLIMATE -- The mean annual range of temperature is 49° with an average maximum of 82° for July and 18° for February. The highest temperatures occur in August and the highest ever recorded is 103°. The lowest temperatures occur in January and the lowest ever re-

corded is -18°. The average number of days with temperatures below freezing are 100 and only on two days of the year do temperatures fall below zero.

The average maximum precipitation is 37.1 inches with a summer maximum; June, July, and August each receiving 3.8 inches. November is the driest month with 2.3 inches. There are 142 days with rain and they are evenly distributed. The amount of sunshine received for the year compares favorable with the other cities studied and is far ahead of Pittsburgh. The topographic conditions for Scranton would appear to make it ideal for the formation of fogs, but there are relatively few. There is a total of 9 for the year with 2 days in January and October. The even crested mountain ridges that hem the valley in on both sides prevent the transportation of warm moist air into the valley, thus allowing only radiation fogs to form.

The prevailing wind direction is southwest for 10 months of the year, being northwest during April and north in September. The high relative humidity and low average wind velocity are vital functions in the silk industry of Scranton. Most of the mills have no artificial means of regulating the humidity of the air in the spinning and weaving rooms; consequently the location of the mills in low-lying moist valleys free from strong winds are more adaptable to efficient production. When the atmosphere is humid and the silk is moist, the fiver posesses the proper elasticity and the mill is able to turn out a larger production.

INDUSTRY -- The accessability of the coal seams, the quality of the coal, the extent of the coal both in width and depth and the absence of intense folding and faulting all were vital factors that



Scranton Weather data

decided the destiny of Scranton as a mining town.

The principal industries of Scranton occupy flat lowlands within the various valleys, the most important of which is the Lackawana River Valley and its tributaries which are; Leggetts Creek, responsible for Leggets Gap an important entrance to the city, Roaring Brook responsible for Nay Aug Gap, Keyser Creek, and Stafford Meadow Brook. The railroads followed the valleys as a matter of economy and to be in the best position to serve the factories. Besides the mining industries of Scranton there are those associated with coal mining, coal assembling and shipping, and the silk industry. The metal fabrication plants employ about 15,000 workers and the textile mills employ a large share of the women and girls of the city.

The central business district of Scranton is located on the valley floor just north of the mouth of Roaring Brook, which divides the eastern half of the city into two equal parts. The less exclusive residential district is on the lowhands of the valley scattered among the factories and commercial houses. The non-industrial workers have sought out more pleasant sites higher up on the mountain slopes where the view is more pleasing, where air drainage is effective, and the air is purer. Along the outskirts of the city there are large tracts of land owned by coal companies, but are not being mined as yet. These areas are inhabited by the lower class of industrial workers, most of whom are foreigners and English is very rarely spoken. The homes are untidy and unsanitary, the streets are unpaved, and sidewalks do not exist. Such sites as these tend to destroy the work of those men whose primary interest is to plan for better cities.

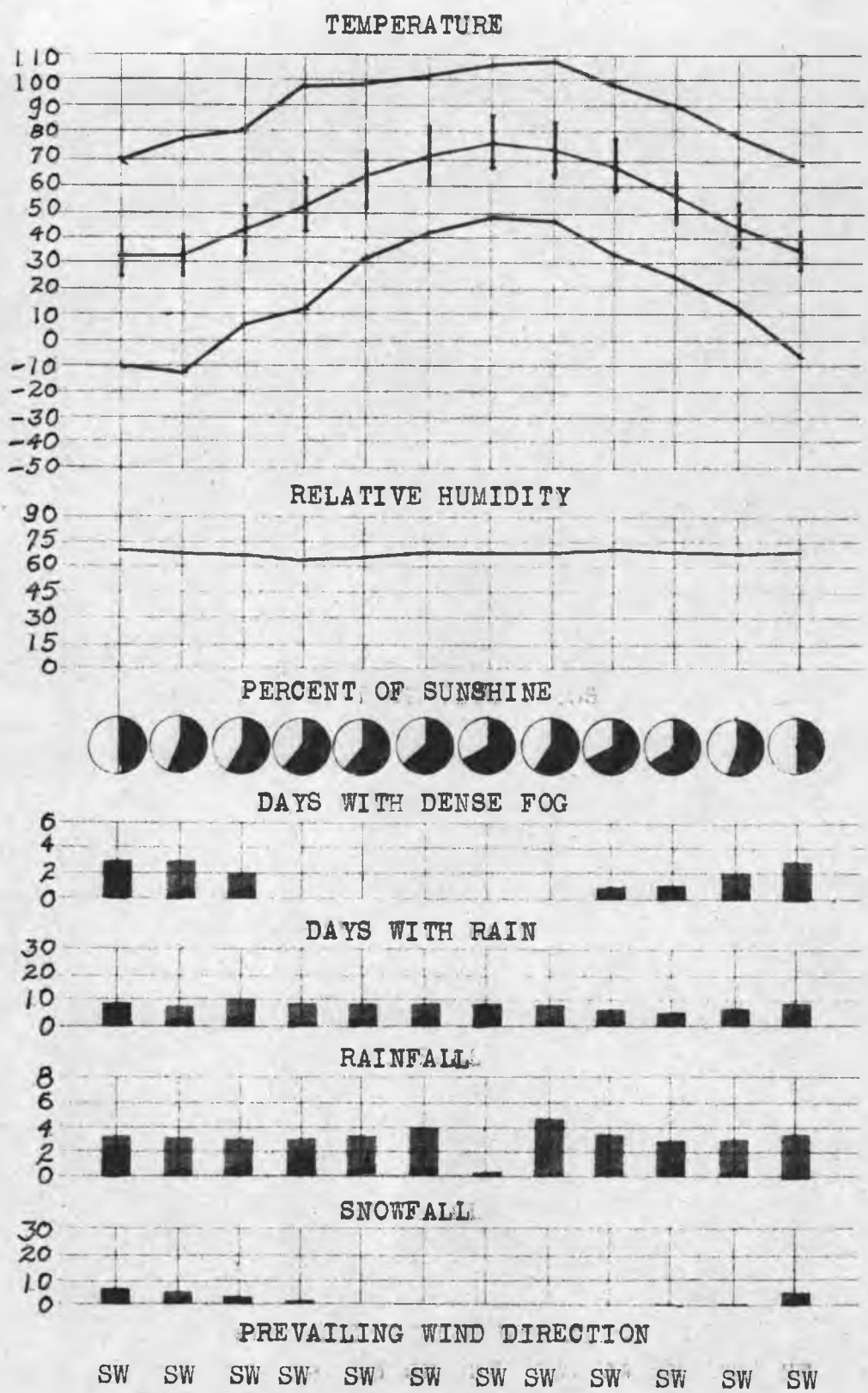
WILMINGTON

Wilmington was settled in 1638 by Swedish and Dutch colonists. In 1832 it was chartered as a city and by 1900 41 percent of the state population were residents of Wilmington. From 1815 to 1826 the building of canals to float hard coal from upper state Pennsylvania down to tidewater via the Schuykill and Delaware Valleys was an important factor to accelerate the growthof Wilmington and the adjacent territory.

The region of Wilmington drains into the Delaware River and it lies within the coastal plain area. North of the city the land is dominated by sloping uplands, hills, and rugged creek valleys. The elevation ranges from sea-level to 200 feet and farther north the slope continues to 1,000 feet. The land occupied by Wilmington is relatively flat terrain marked by placid watercourses. Brandywine Creek and Christiana River flow throughtthe city itself and the land along both banks of Christiana River is marsh land as well as that from the junction of Brandywine Creek and Christiana River to the waters edge of the Delaware River. All of this land is occupied by industry, a great share of it by the Du Pont Powder Works.

CLIMATE — The average annual temperature for Wilmington is 54.2° with a July maximum of 85.8° and a January minimum of 25°. There are 20 days of the year with temperatures above 90° and the highest recorded temperature is 107°. There are 98 days in the year with temperatures of freezing or below, but only one day when the temperature falls to zero or below. The lowest temperature recorded for this region is -12°.

The average annual precipitation is 43.7 inches and the

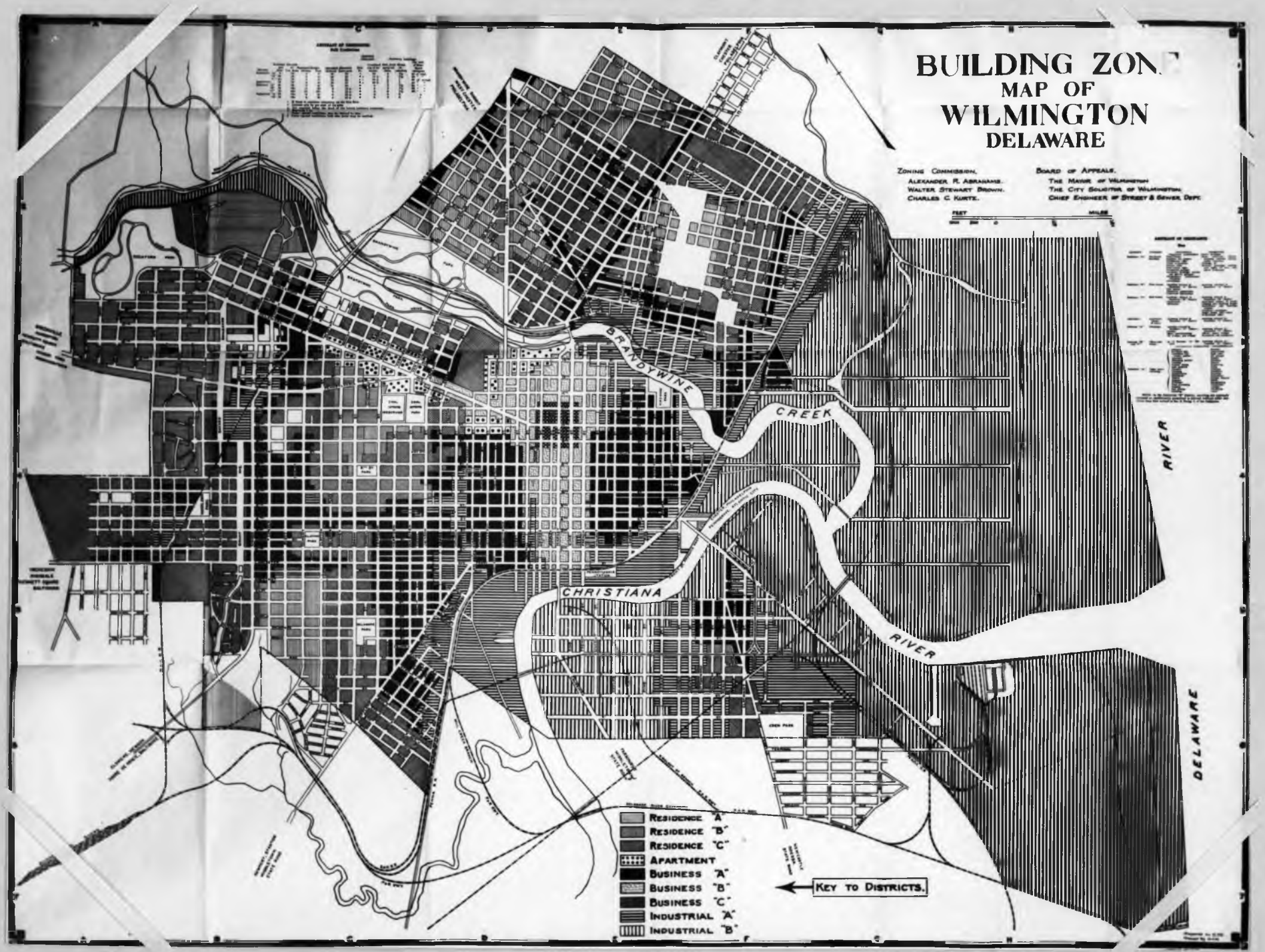


Wilmington Weather data

number of days with rainfall of .01 inch or more total 101. The distribution of rainfall is rather uniform with a slight maximum occuring during July and the least amount during November. Two of the principal storm paths across the United States are far enough to the north of Delaware to produce in this state a climate characterized by an abundance of sunshine, a mild winter, and an unusually long frowing season. The passing of the lows north of Wilmington give veering winds and this often means a quick change to clearing weather.

No other city studied has such a low relative humidity for the year. The curve remains below 75 percent for the entire year. Although the summer humidity is comparable to most of the other cities studied the lower humidity in the winter bears out the indication of fewer rainy days. Dense fogs occur during the winter months and usually accompany a southeast wind. Even though the prevailing wind direction for the winter months is northwest there are days that are suitable for transporting warm air from the Chesapeake Bay Region and the Atlantic Ocean over the cooler land areas to the north and west. The location of industries in Wilmington are concentrated on the southeast side of the city, an ideal location in regard to the prevailing wind direction, whether it be during the summer or winter.

INDUSTRY -- The proximity of Wilmington to the Tri State district of Philadelphia, Pennsylvania and Camden, New Jersey renders it one of the great manufacturing and industrial districts of the East. Approximately one-half of the people of this region today are sustained by economic returns from industry with about 675,000 persons actually engaged in industrial pursuits. The railroads


BUILDING ZONE
MAP OF
WILMINGTON
DELAWARE
ZONING COMMISSION.
ALEXANDER R. ABRAHAMS.
WALTER STEWART BROWN.
CHARLES C. KURTZ.
BOARD OF APPEALS.
THE MAYOR OF WILMINGTON.
THE CITY SOLICITOR OF WILMINGTON.
CHIEF ENGINEER OF STREET & SEWER DEPT.
FEET
MILES
BRANDYWINE
CREEK
CHRISTIANA
RIVER
RIVER
DELAWARE
RESIDENCE "A"
RESIDENCE "B"
RESIDENCE "C"
APARTMENT
BUSINESS "A"
BUSINESS "B"
BUSINESS "C"
INDUSTRIAL "A"
INDUSTRIAL "B"
KEY TO DISTRICTS.

48

serving this area are the Baltimore and Ohio, the Philadelphia Baltimore and Washington, and the Philadelphia and Reading. Railway facilities and nearness to coalfields of Pennsylvania, nearness to the sources of supply of raw materials and the availability of water power supplied by the Brandywine Creek have made Wilmington the most important manufacturing center of Delaware. In a distinctive manufacturing class of its own are the works of the Du Pont Powder Company, the largest of its kind in the world covering 1,000 acres.

Industry occupies the eastern one-third of the city fronting the Delaware River. Business districts and residential districts occupy the rest of the land with the exclusive residential district in the northwest part of the city. Wilmington is an excellent example of city planning to render the best climatic conditions for the residents of the city.

ROANOKE

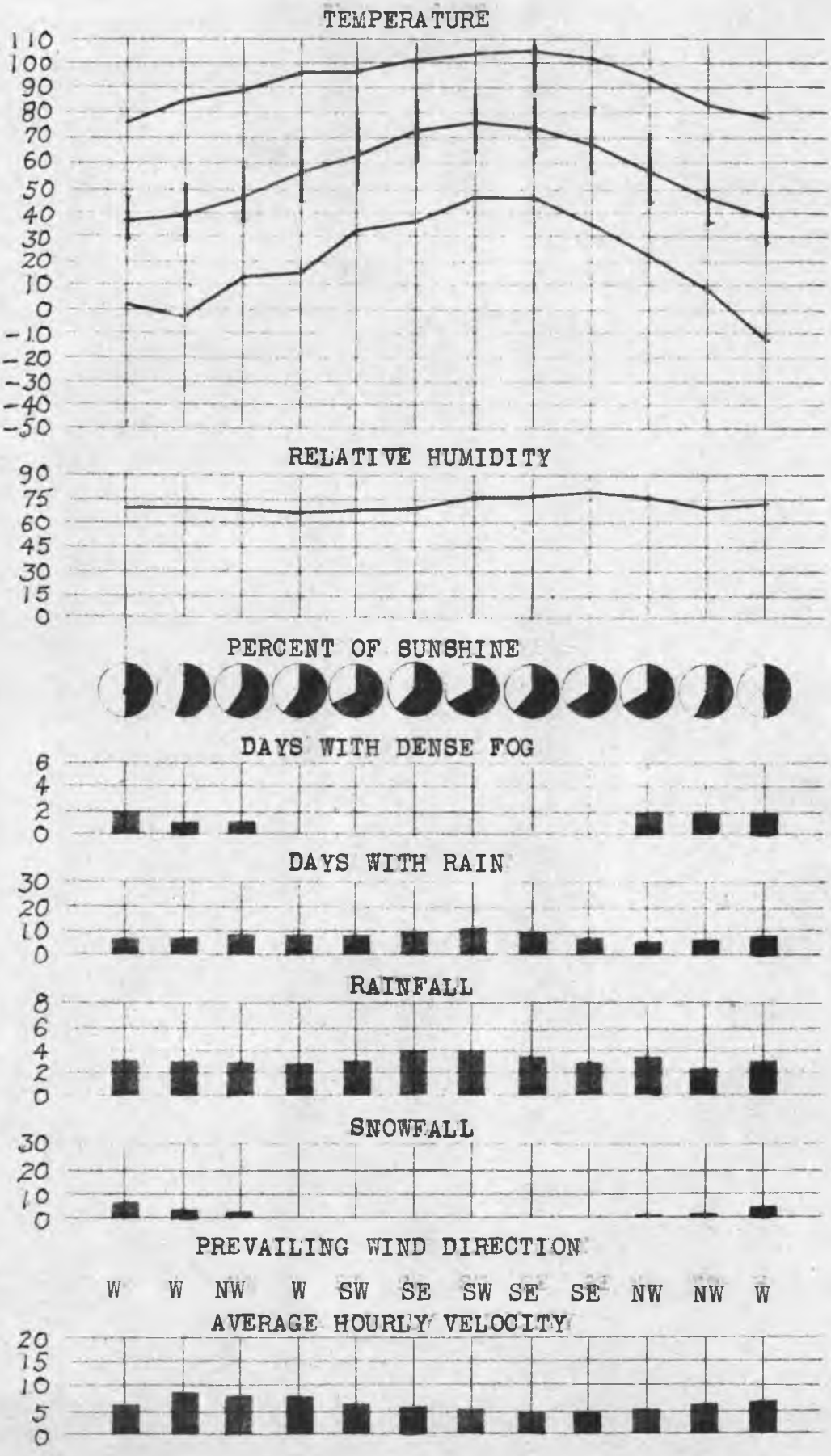
At the junction of two valleys, the Roanoke and the Susquehanna stands the city of Roanoke, Virginia. The region occupied by Roanoke is dissected by the Roanoke River and several smaller tributaries that have the Blue Ridge Mountains as their source. The area is in the mature stage of the topographic cycle with numerous mountains and gaps surrounding the region. Even within the city itself Tinker Hill rises some 500 feet above the city and Mill Mountain, 1790 feet in altitude, is 800 feet above the surrounding land. The numerous valleys and gaps are very effective in controlling the direction of the wind as well as providing ideal conditions for air drainage. Two spurs of the Blue Ridge and

Allegheny Mountains to the north form a right angle, the apex of which directs a northwest, north, or northeast wind directly toward the city of Roanoke.

CLIMATE -- In the vicinity of Roanoke in south-central Virginia the annual range of temperature is rather large and the variability of daily and annual extremes is greater than on the coastal plains. The elevations between valleys and ridges operates to produce local temperature differences. Air drainage is rather prominent in this region and many times frost occurs on the valley floor when there is none on the surrounding hills. The average annual temerature is 57° with an average maximum of 88° for July and an average minimum of 29° for December. The highest temperature ever recorded is 107° and the lowest is -12°.

The average precipitation for Roanoke is 39.7 inches. Of the cities studied it ranks second only to Wilmington, Delaware in the amount of rainfall. The maximum amount is received during the months of July and August with each month receiving four inches. November is the driest month with 2.8 inches. With the exception of St. Paul, Roanoke has the least number of rainy days of any of the ten cities studied. For all of the territory east of the Mississippi River it is only in the very southern states that stations have recorded so small a number of rainy days. The amount of sunshine received by Roanoke is a high percentage of the possible. Only one month of the entire year (December) receives less than 50 percent of the possible and for this month the percentage is 49.5 percent.

The prevailing wind direction for Roanoke shifts frequently during the year and not more than any two months in succession



Roanoke Weather data

have the same prevailing wind direction. Prevailing southeast winds in August and September with very low humidities causes warm moist air to be drifted into Roanoke Valley and produce very high relative humidity for these months.

Dense fogs occur on 9 days of the year and are distributed evenly among the first and last three months of the year. The fogs are of the radiation type due to the sliding of the colder air into the valley shortly after sunset. The explanation of radiation fogs in connection with other cities so affected explains the same for Roanoke.

INDUSTRY -- Roanoke is to a large extent a railroad city, for the Norfolk and Western Railroad has large shops and offices located there. The work done by the men is of a permanent nature and they have built homes and established families. Industry and railroads in general have located along the Roanoke River and a narrow section in the northern part of the city paralleling the Roanoke River. Heavy industry is restricted to the eastern extremities of the city where odors, noise, and dirt will not be offensive to the occupants of the city. Industrial development should continue to expand along the railroads which traverse the bottom lands along the Roanoke River, between Roanoke and Salem, with spurs to the north along the Norfolk and Western Railroad and to the south along the Winston Salem Division of the same railroad. Sites for industries of large scale are somewhat limited and should not be encroached upon for other uses, but should be kept free for any such opportunities as bringing new plants to the region.

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